PMA 99-0189

CALIFORNIA DAIRY PEST MANAGEMENT EVALUATION

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ABSTRACT

The pest management evaluation on dairy cattle was undertaken to provide insight into the pest issues facing the producers in this industry. The intent was to understand the pest management complexes, the current methods of controlling pests, and the economic impact that various regulatory legislation would have on this group. The survey list represented Western United Dairymen's member list. We mailed out 1100 surveys and received responses with data from 272 producers (25% response) throughout the state's 12 regions. Of the 272 respondents, 1% had 1-49 dairy cows, 1% had 50-99 cows, 26% reported 100-499 cows and 72% reported having 500+ cows. The total number of milking cows + replacement heifers was >312,744 or >22% of the animals in the state. Survey results indicate that stable flies, house flies, face flies, and rodents (mice and rats) are the most important pests encountered during production. This industry reported heavy use of organophosphates, permethrin, and carbamates for fly control and rodenticides for rodent pest control. These particular products have been cited for concern in several regulatory categories: FQPA pesticides (organophosphates, carbamates and permethrin), resistance management, management of a potential new pest, and impact on endangered species. The survey indicated that there are opportunities and challenges in educating this constituency and that alternative methods to reduce the use of these pesticides may be available for implementation through either demonstration, further evaluation, and education/outreach.

A. CALIFORNIA DAIRY CATTLE: PRODUCTION

California is the number one dairy state in the US with 1,420,000 total cows. The California dairy industry is also the number one agricultural commodity in the state, producing 27.6 billion pounds of milk (1998) which contributed $4.3 billion in farm cash receipts. The state contributes 17.5% of total US milk production. CDFA (1997) reports in their annual summary that production costs on a per cow basis statewide averaged $2516/cow/year. Milk was utilized as follows (CDFA, January 2000): ~20% fluid milk, ~4% soft products (cottage cheese), ~4% ice cream, ~35% butter, ~37% cheese. There are 2100 dairy farms located throughout the state. The largest statewide dairy organization is Western United Dairymen (WUD) which represents 56% of all California dairies.

B. PRODUCTION REGIONS

Dairies are found throughout California, from Shasta through San Diego county. The heaviest concentrations are in the Central Valley and Chino Basin. Although found in diverse environments, all dairies appear to have similar pest problems, primarily flies and rodents.

C. CULTURAL PRACTICES

The advent of nutrient management programs has elevated the awareness of good manure management for most of the dairies in California. These involve better grading of pens, more efficient water management, more timely manure cleanout schedules and better manure handling techniques. This has contributed toward reducing fly populations on many farms. The trend toward single age farms, ie, custom calf, heifer or milking operations has also reduced the number of flies on the milking farm.

D. CATTLE ECTOPARASITES (from a review by Dr. N.Hinkle)

Cattlemen must contend with a variety of arthropod pests that affect animals in many ways. External parasites feed on blood, skin, and hair, resulting in discomfort and irritation for the animal. More significantly, however, blood-sucking arthropods may transmit diseases from infected animals to healthy ones. Insects, ticks and mites cause direct annual losses nationwide to livestock industries estimated at over $3 billion annually. These losses include reduced feed conversion efficiency, reduced weight gain and milk production, increased meat trim, hide losses, and even occasionally death of the animal. These losses result from blood loss, irritation, annoyance, animal behavior to avoid the discomfort of insect attack, insect contamination of meat, and damage to hides and skin prior to slaughter. In addition to these direct losses, many animal diseases such as bluetongue, pink eye, epizootic bovine abortion, and anaplasmosis are transmitted by insects. Insect-transmitted diseases cause additional losses of hundreds of millions of dollars annually. In addition, flies are public nuisances and serve as a source of aggravation to neighbors and other members of the community.

Probably the most significant cattle ectoparasites are the flies. About 20 families of flies are of veterinary importance. Flies have complete metamorphosis with egg, larva, pupa and adult stages in their development. The female fly deposits her eggs in moist organic material. The larvae, or "maggots," develop in decaying organic material, with horn flies and face flies developing almost exclusively in manure, and house flies preferring it. Stable flies typically undergo larval development in decaying plant material such as wet decomposing hay, moist grass clippings, or the compost heap.

When the maggots have completed their development and are ready to undergo the next step in their metamorphosis, they convert the last larval skin into the puparium, a hardened shell within which the pupa will develop. The pupa then transforms into the adult fly and the adult pops the end of the puparium and emerges. Using internal pressure, the fly unfolds its wings, allowing them to dry and harden before it can fly. Under good conditions the egg to adult development may require only a couple of weeks. Once the female fly has mated, she can lay several egg batches, typically containing over a hundred eggs each.

Primarily it is the adult stage that attacks cattle and adequate control can be difficult because of the

short time that most flies spend on the host. "Source reduction," or elimination of larval habitat, is the preferred pest fly suppression method. By removing the material in which larvae develop, the fly life cycle can be broken, preventing subsequent production of the adult pests.

Of particular concern are the manure-breeding flies. Several of these are quite pestiferous and their numbers can reach high levels, causing problems both to the herd and for surrounding neighborhoods. For animal health and productivity, as well as for human comfort, manure must be managed to minimize fly production. While chemical pesticides may be necessary for suppressing adult fly populations, they are no substitute for prevention via source reduction or breeding site elimination.

House Fly The house fly (*Musca domestica*) is a cosmopolitan companion of humans and their livestock. House flies have been demonstrated to mechanically transmit the causative agents of several diseases including cholera, salmonella, yaws, dysentery, etc. House flies are less than half an inch in length, gray, with four dark stripes down the dorsum of the thorax. House flies have sponging mouthparts.

Under favorable environmental conditions the house fly can reproduce prodigiously, having both a short generation time and producing large numbers of eggs per female. Each female lays several egg batches, containing up to 150 eggs each. Under good conditions the eggs hatch in less than a day. The larvae can then complete pupation within a week and the adult emerges in four to five days, meaning that a generation can be completed in less than two weeks. During one summer, therefore, ten to twelve generations can develop.

Mechanical control remains the first line of defense against house flies. Screens on windows and doors limit their access to our homes. A fly swatter can be used effectively against the stray individual that finds its way into the house. Properly disposing of organic waste limits their breeding areas. Maintenance of areas around water troughs and feedlot contouring to encourage proper drainage are essential to limit house fly larval breeding sites. Selective insecticide use against house flies is merely one component of a total fly management program.

Face Fly The face fly (*Musca autumnalis*) appears virtually identical to the house fly. It also has sponging mouthparts. However, face fly behavior is distinctive in that they preferentially feed around the cow's head on secretions from the eyes, nose and mouth. Their mouthparts consist of small rasp-like structures that they use to damage eyes to increase tear secretion. Their habit of feeding around the eyes makes them successful vectors of the causative agent of pinkeye (*Moraxella bovis*). Face flies are even more difficult to control than many other flies because they may feed on other protein sources besides facial secretions so that treating the animal does not necessarily mean effective fly control.

Female face flies lay their eggs only in fresh manure. The larvae feed in the manure until pupation, when they crawl away to a suitable site. The life cycle is completed in about two weeks.

Face flies are particularly a problem in northern and central California. The hotter, drier weather in southern California is not conducive to their development.

Face fly control is challenging because residual insecticides have a brief life on the animal's face due to licking, tearing, and rubbing of vegetation against the face as it feeds. Mechanical devices which prevent the fly from contacting the face have utility. Ear tags which provide constant season-long exposure to the toxicant have been most effective in protecting animals from face flies.

Stable Fly The stable fly (or dog fly, *Stomoxys calcitrans*) looks a lot like the house fly in both size and color, but the mouthparts extending almost like a bayonet from the front of the head indicate its biting habit. Both stable fly sexes are vicious biters and, as strong fliers, they may range many miles from their breeding site to seek hosts.

Stable flies are common on California cattle in the spring and early summer (and sometimes in late fall). They are more common around feedlots and loafing pens than on pasture. The irritation of their bites may drive cows to dart from one end of the lot to the other in an effort to flee the painful injury they produce. In addition to reducing feeding, elevating body temperature, using energy and putting stress on the animal, cows may injure themselves in their headlong flight to avoid these pests. Instead of feeding, cows may cluster together in an effort to deter these flies and reduce the area available to them. These flies are easily interrupted in feeding and may be mechanical vectors of anthrax and anaplasmosis.

Stable flies breed in soggy hay, grain or feed, piles of moist fermenting weed or grass cuttings, commodity pits, and manure well mixed with hay. They do not successfully develop in pure manure. The female fly crawls into crevices in the substrate and deposits eggs in cracks, laying up to 600 eggs in four batches during her lifetime. The eggs hatch in 2 to 5 days and the larvae feed on the moist substrate, pupating in two or three weeks. Depending on season and temperature, the life cycle may take between 22 and 58 days. Adult stable flies can fly several miles seeking a host. While normal fly populations are usually less than 10 per animal, higher numbers usually indicate local breeding.

Stable fly suppression is based on cultural control measures. Since larvae require a moist breeding medium, it is essential that the breeding source be located and dispersed to permit drying. Resting sites may be identified and treated with a residual insecticide to suppress adults. The flies spend very little time actually in contact with the host, so insecticide applications to the cattle are usually not very effective against stable flies.

Horn Fly Horn flies (*Haematobia irritans*) are biting flies that somewhat resemble house flies, but are only about half the size. They feed chiefly on cattle, spending their entire adult life on the animal. Horn flies congregate on the topline during cool periods, but hide on the belly to avoid midday heat. Each horn fly takes a blood meal about once an hour, so even though they are small flies, feeding frequency and the numbers of flies found on a single animal may result in considerable blood loss. It has been estimated that this species is responsible for more loss to beef cattle production in the U.S. than any other single species of arthropod pest. This is a minor pest on most dairy operations, however, when present, they cause significant irritation to the animals.

Female horn flies leave the host only to lay their eggs in freshly deposited manure. The eggs hatch in 24 hours and the larvae feed within the manure pat until they are ready to pupate. Adult horn flies may emerge within two weeks following egg hatch.

Because the adult fly spends all its time on the host, insecticides applied to the host can effectively reduce horn fly numbers. Applications may be made by spray, dust bag, back rubber, etc. to provide sufficient residual to suppress horn flies. Ear tags are commonly used to provide season-long treatment; however, these constant exposure devices may rapidly select for insecticide resistance and should be implemented as part of a total pest management program. Control strategies for horn flies that minimize resistance include alternating use between pyrethroid and organophosphate ear tags, dust bags, backrubbers, sprays, and boluses; putting ear tags in ears later in the season; omitting chemical control entirely for a couple of years; and using nonchemical control (such as walk-through traps).

Mosquitoes Mosquitoes are small flies with piercing-sucking mouthparts. Only the females suck blood. Several mosquito species attack livestock, and their painful bites result in unthriftiness, with anemia occasionally produced from blood loss. Their attacks can cause weight loss and decreased milk production.

Mosquito eggs are laid on or around standing water, either in containers or ground depressions. Common breeding sites for mosquitoes are drainage ditches, ponds, tin cans, old tires and tree holes. Eggs of most species hatch in 2 to 3 days, and the larvae or "wigglers" strain organic material from the water for nourishment. The larvae pass through 4 stages in a week or so,

depending on water temperature. The pupal stage lasts 2 or 3 days, and the adult mosquito emerges at the water surface.

Mosquito control is most effective when source reduction is practiced, that is, eliminating breeding areas. Fogging or aerosoling for adult mosquitoes provides only temporary relief.

Black Flies Black flies look humpbacked; they are small, dark, chunky flies. Adult females are not host specific, but suck blood from a variety of hosts during the daytime. Black flies hover around animals' ears, eyes and nostrils, landing to deliver painful bites. In addition to the pain, blood loss and possibility of anaphylactic shock due to the bites, they may also serve as vectors of some disease organisms.

Black flies lay their eggs in flowing water and the larvae attach to submerged objects. Depending on the species and water temperature, development may take weeks or months. Adult black flies are strong fliers and may fly up to 10 miles from their breeding sites.

Biting Midges The tiny biting flies known as punkies or no-see-ums breed in wet or aquatic habitats and are very difficult to control. In addition to the annoyance and irritation of their bites, these flies serve as vectors of bluetongue virus (which may cause abortion in cattle) and intermediate hosts of helminths. The most significant bluetongue vector preferentially breeds along the shallow margins of organically rich ponds, especially settling ponds and water holes contaminated with manure. The most effective control strategy in these situations is increasing margin slope to reduce the shallow water zone. Source reduction of the wet areas where these flies breed is essentially the only control option currently available.

Horse Flies and Deer Flies Horse flies and deer flies are also very strong fliers, dispersing many miles from the aquatic situations where the larvae developed. Only the females bite, with strong mouthparts that produce large wounds which ooze blood even after the fly has completed feeding. Their painful bites stimulate animals to run to avoid further attack, resulting in lowered weight gains and low milk production. Being intermittent feeders, they can be important mechanical transmitters of diseases such as anthrax, tularemia (deer fly fever), and anaplasmosis. Their behavior in spending only a brief time on the host also means that residual insecticides are ineffective against them.

Most species are aquatic, with the eggs being laid around water and the larvae preying on insect larvae, crustaceans, snails and earthworms. The larvae crawl to drier areas to pupate, and the pupal stage lasts 2 to 3 weeks. The life cycle varies considerably from species to species, with some taking only a couple of months, and others over two years to complete development. There are many species of both horse flies and deer flies, with some species active at any given time of year.

Cattle Grubs The two cattle grub species, adults of which are called heel flies, found in North America are the common cattle grub (*Hypoderma lineatum*) and the northern cattle grub (*Hypoderma bovis*). The tumorous swellings they produce in cows' backs are the larval development sites, called warbles. Following their migration, larvae lodge along the cow's backline and bore a breathing tube through the flesh. Mature larvae are robust, often reaching over an inch in length.

Attempts by the female fly to oviposit on the host are met with behavior called "gadding," a mad dashing about to avoid the fly. While the female inflicts no pain while laying eggs, it is apparent that her presence (likely the buzzing sound made when flying) is extremely irritating to the host. Eggs of both species are attached to host hairs, usually on the lower leg. Within a week the eggs hatch and the tiny larvae crawl down the hair and penetrate the skin, causing considerable irritation. The larvae then migrate through the host's body, often for several months, before finally ending up beneath the skin of the back. To obtain oxygen, the larva cuts a hole to the outside. The host body reacts to the larva's presence by walling it off and producing the characteristic swelling, or warble.

Larval development takes five to eleven weeks from this point, and then the larva works its way out through the breathing hole, falls to the ground, and pupates. The adult warble fly may emerge in four to eight weeks.

The injuries produced by these pests include the irritation caused by the wandering larvae in their migrations through the body and secondly the trauma produced in the tissues surrounding the warble. In addition, the open warble develops into a running wound even after the larva emerges, serving as a site of secondary infection.

Obviously, there are several aspects of economic loss produced by warble flies. The gadding and overexertion are stressful to the animal, reducing feeding, and often result in injury. Milk production may decrease by as much as 20%. Carcass value is diminished because areas around the warble sites become greenish yellow and jellylike in appearance, leading to condemnation. The hide value is likewise decreased because of the holes left by the grubs.

Treatment timing for cattle grub is critical. Because of anaphylaxis risk, treatment must be instituted while the larvae are still in the first instar. Because the developmental period depends on climatic factors and varies depending on the region, a veterinarian or extension advisor should be consulted prior to initiating treatment for cattle grubs. While pour-ons and systemic insecticides are most effective for grub control, sprays, dips, and feed-throughs may also be used.

Infestation by Fly Larvae Myiasis is the presence of fly larvae in host flesh. Several kinds of maggots can infest the wounds of warm-blooded animals, but the only one that feeds on living tissue is the primary screwworm (*Cochliomyia hominivorax*). Screwworms have been eradicated from North America, using sterile male releases, but the reinfestation threat continues. Any suspected screwworm case should be reported to the Extension livestock advisor. Samples of eggs and maggots should be preserved in alcohol. Wounds should be treated with an insecticidal dust, spray or ointment. As screwworms lay their eggs only in pre-existing wounds, efforts should be made at prevention and treatment of wounds such as cuts, abrasions, tick bites, etc.

Cattle Lice The five most significant lice affecting cattle include *Bovicola bovis* (cattle biting louse), *Haematopinus eurysternus* (shortnosed cattle louse), *Linognathus vituli* (longnosed cattle louse), *Solenopotes capillatus* (little blue cattle louse), and *Haematopinus quadripertusus* (cattle tail louse).

Cattle lice live permanently on the host, the sucking lice feeding on blood and chewing lice on skin scales. Both immature and adult stages are parasitic, therefore they must remain on their hosts to survive. Cattle lice are found strictly on cattle; they will not infest horses, swine or other animals. The sucking lice are specific to the area which they occupy on the host, while chewing lice may be more widely spread out over the animal.

Heavily infested animals often have an unsightly appearance due to rubbing and scratching to relieve itching. Frequently fences and buildings are damaged by rubbing. The first indication of a louse infestation in the herd may be large tufts of hair on barbed wire fences. Heavy *Haematopinus eurysternus* populations may cause severe anemia, which may result in abortions, weak or exhausted animals, and even death. Other problems associated with lice are decreases in weight gain and milk production, and leather damage.

Typically cattle louse density in the United States is highest in the winter and early spring, and lowest in the summer. However, even though numbers are much lower, lice do not disappear completely from most cattle even during the summer months. During summer, *B. bovis* are found mostly on the poll, forehead, rump and tail. *L. vituli* infests mostly the shoulders, rump and face. *S. capillatus* is reportedly located almost exclusively on the face in the summer, while *H. eurysternus* is typically on the ears, cheek, muzzle, brisket, dewlap and neck.

Lice are generally transmitted from one animal to another by contact. Transmission from herd to herd is usually accomplished by transportation of carrier animals, although some lice may be carried

by clinging to flies (phoresy).

Louse feeding is irritating to the host, and infestations may be recognized by animal behavior. Sucking lice pierce the host's skin and draw blood. Chewing lice feed on particles of hair, scabs and skin exudations. The irritation from louse-feeding causes animals to rub and scratch, producing raw areas on the skin and hair loss. Hair on fences and equipment resulting from this scratching is evidence of louse infestation. The nervousness and improper nutrition often produce weight loss, and the host is frequently listless. Milk and beef production may be reduced about 25 percent. In severe cases blood loss to sucking lice can lead to anemia and result in abortion.

The usual time from egg to egg-laying adult is about 28 days. The female louse glues her eggs to host hair, close to the skin. Eggs hatch in 8 to 12 days, depending on the species and temperature. The nymphs go through 3 stages and are full grown in about 3 weeks.

When cattle scratch and rub to excess, control efforts should be taken. The first step in controlling lice is to maintain animals in a good state of health and nutrition so that they are better able to control infestations by themselves. Carrier animals should be removed if their infestations prove to be chronic in nature.

Insecticides can be used to treat animals for lice, but it is important to get total body coverage with liquids and dusts. Louse control is challenging because pesticides do not kill the eggs. Eggs of most species will hatch within a week or two following laying, so retreatment is necessary two weeks after the initial insecticide application. New animals being added to the herd should be checked for the presence of lice and treated to prevent introduction. Cattle tail lice are a special problem because eggs can survive and hatch up to 40 days after oviposition. Therefore, a second insecticide application should be made 3 weeks after the first. As these lice are almost exclusively restricted to the tail switch, treatment can be applied only to the lower half of the tail. Most effective louse control is obtained with forced use of dust bags. Residual sprays, dips and pour-on materials usually give satisfactory control as well. Pour-on systemic insecticide formulations provide longer residual louse control than do sprays or dusts.

Ticks Ticks are eight-legged leathery arthropods with no apparent body divisions. Typically the mouthparts project outward from the front of the body, giving it a teardrop shape. These mouthparts, which are inserted through the skin, bear recurved teeth, allowing the tick to maintain a firm hold. Unfed ticks may be less than 1/16 in. long while fully fed females may reach over half an inch in length.

All stages and both sexes feed on blood. After each blood meal the tick drops off the host, molts, and seeks a new host. After the adult female feeds, she drops off, finds a crevice, and lays from a few hundred to several thousand eggs. The seed ticks which hatch from the eggs are the larval stage and possess only six legs. They typically climb up vegetation in order to contact passing animals. After their first blood meal, these larvae molt into 8-legged nymphs and go through several nymphal stages.

Ticks have various effects on their hosts including inflammation, bite site swelling and itching, blood loss, wounds that may serve as sites of infection or invasion by other pests, and paralysis produced by the fluids they inject in their salivary secretions. They also transmit diseases such as tularemia, anaplasmosis, and bovine piroplasmosis.

Area control of ticks may be attempted with several acaricides. Large area modification to reduce available habitat is effective if done properly. Insecticide sprays or dips are best used for on-animal tick control.

In California, the Pajaroello tick (*Ornithodoros coriaceus*) transmits the causative agent of Foothill Abortion, also called Epizootic Bovine Abortion. Another soft tick *Otobius megnini*, the spinose ear tick, can cause injury and deafness. Other common ticks include *Ixodes pacificus*, a hard tick

common on deer and cattle in California, and *Dermacentor andersoni* (the Rocky Mountain wood tick), the toxin of which may cause tick paralysis.

Mites Like ticks, mites have a hemispherical body with 8 legs (6 in the larval stage). Most mites are extremely small, with many barely visible to the naked eye.

Itch and mange mites (*Psoroptes*, *Sarcoptes*, and *Chorioptes*) burrow just under the skin surface, producing very slender, winding tunnels up to an inch long. Female mites lay their eggs within these tunnels. Intense irritation and itching results from the toxin which is produced by the mites, causing infested animals to rub and scratch continuously. This often results in inflamed areas that are subject to secondary infection. As the mite infestation spreads, large, cracked scabs form on the thickened skin. Mite infestations are contagious, so it is imperative to isolate infested animals and treat them to prevent spread.

A seldom seen condition is demodectic mange of cattle caused by *Demodex bovis*. The mites produce swellings as large as hen's eggs, filled with a cheesy or fluid substance containing the mites. The nodules produce holes in the hide, lessening the value of the leather. Control is difficult because the mites are protected deep within the skin of the host.

Nonarthropod Parasitic Pests of Dairy Cattle

Production of dairy cattle also involves managing internal parasites such as roundworms, tapeworms, liver flukes and lungworms and "worming" is a common practice in this industry. Some anthelmintics and endectocides, notably macrocycliclactones-based chemicals such as ivermectin, moxidectin and doramectin, have ectoparasiticide activity. Worming is normally done one or two times a year and coincides with when the cattle are handled: in the spring when they are moved or weaned and during calving in the fall.

Cattle are grazed in managed pasture environments which may have vertebrate "pests" such as mountain lions, coyotes and feral dogs and toxic weeds. Cattlemen traditionally use firearms, traps, rodenticides and selective herbicides to maintain their herds and quality of pastures.

E. WEED CONTROL

Most producers use Round-Up around corrals and right-of-way. A relatively small percentage of land requires treatment since most is trampled by the animals or covered by the farm buildings.

F. DISEASE CONTROL

Dairy cows are routinely vaccinated for disease protection. Disinfectants are used around the dairy to wash down equipment and milking areas and on animals if necessary (e.g., teat dips). We did not survey this industry's use of disinfectants.

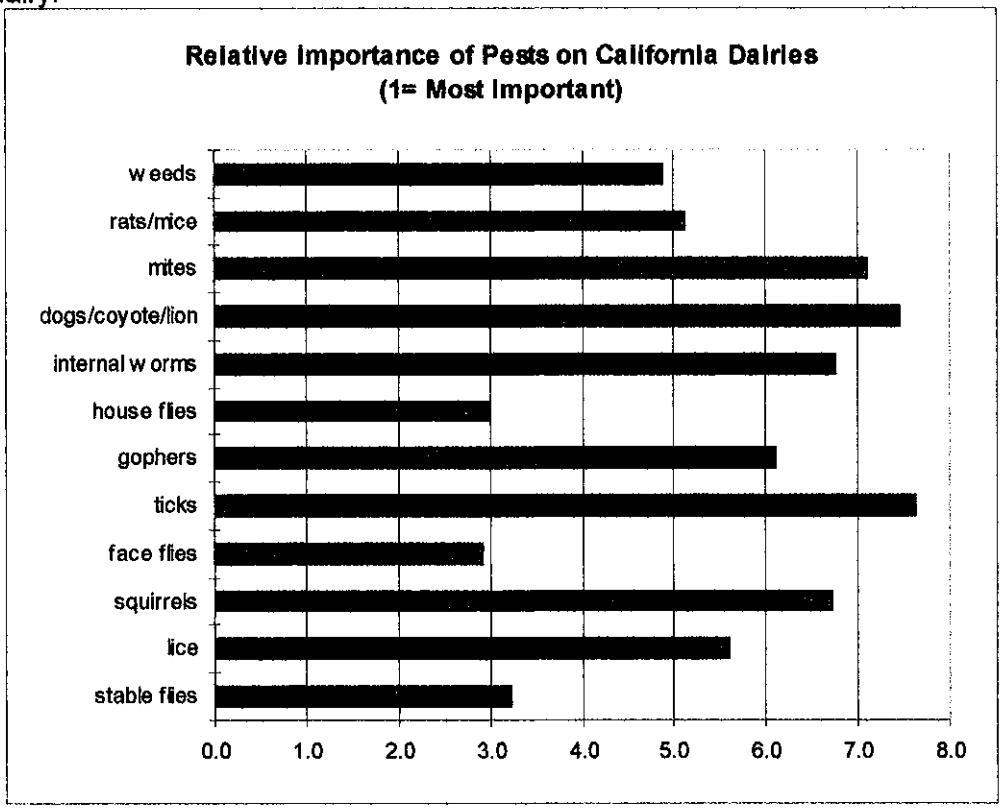
G. VERTEBRATE CONTROL

Rodent control is usually the responsibility of the producer (vs a professional service) and is done on an as needed basis. Little information is available regarding the potential for rodenticide resistance on these farms, however, rodents can occur in very high numbers because of the availability of protected harborages. Rodent burrows and nests around feed bunks or silage preclude the use of rodenticides because of contamination concerns in the feed.

H. PEST MANAGEMENT SURVEY RESULTS ON DAIRIES

We asked producers 14 questions regarding their pests. Each question and the summary of the answers follow:

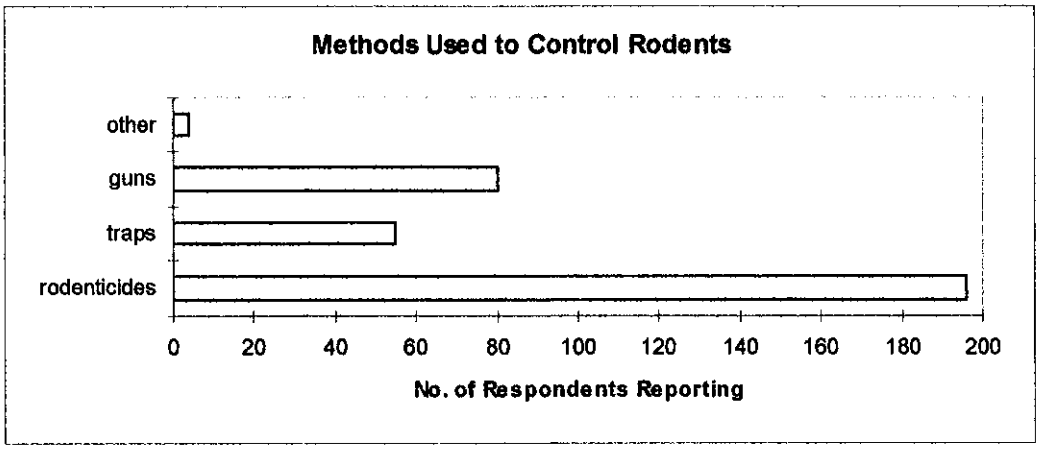
1. Rank from 1 for the worst problem to 12 for the least problem for the top 12 pest problems in your dairy.



The most important pests were flies: stable fly, house fly and face flies. We were not able to discern from this questionnaire whether our respondents could tell the difference between true face flies and house flies which are often found around the head and face of an animal. The two flies are very similar in appearance.

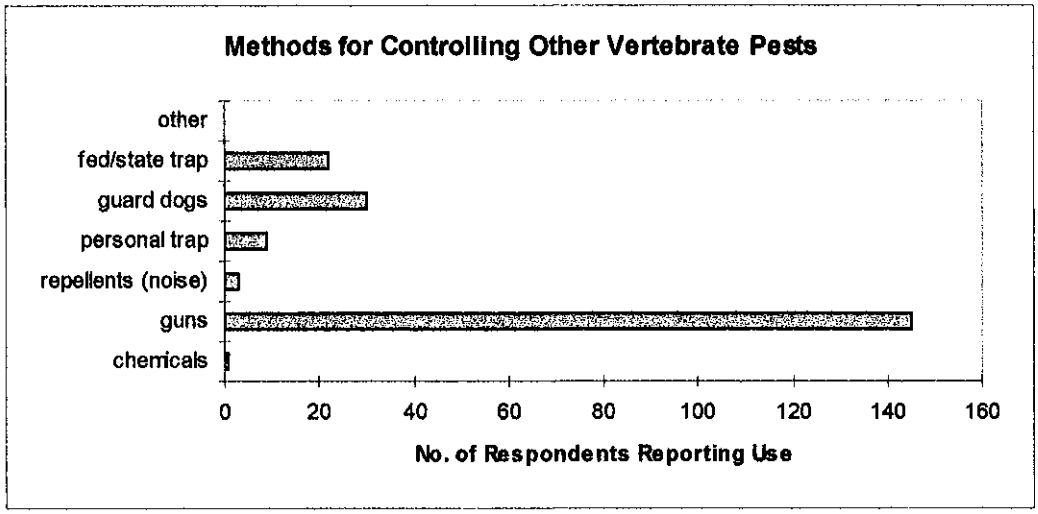
Several respondents also reported wild birds, especially pigeons, as important pests on farms.

2. What control methods do you use for rodents, gophers, squirrels, etc.?

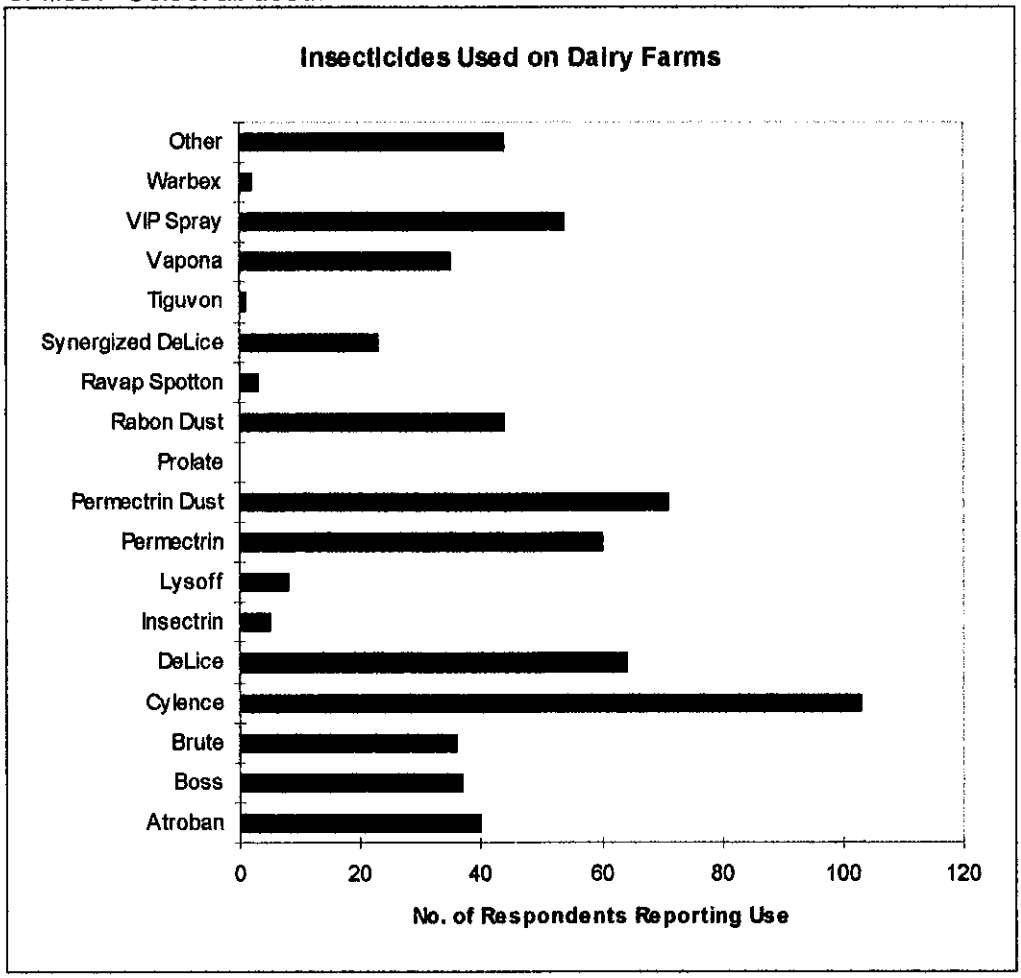


Respondents overwhelmingly used rodenticides. Other management techniques mentioned were cats, dogs, owls, flooding, fumigants/gas bombs, and shovels.

3. What control methods do you use for other vertebrate pests such as dogs, coyotes or mountain lions?

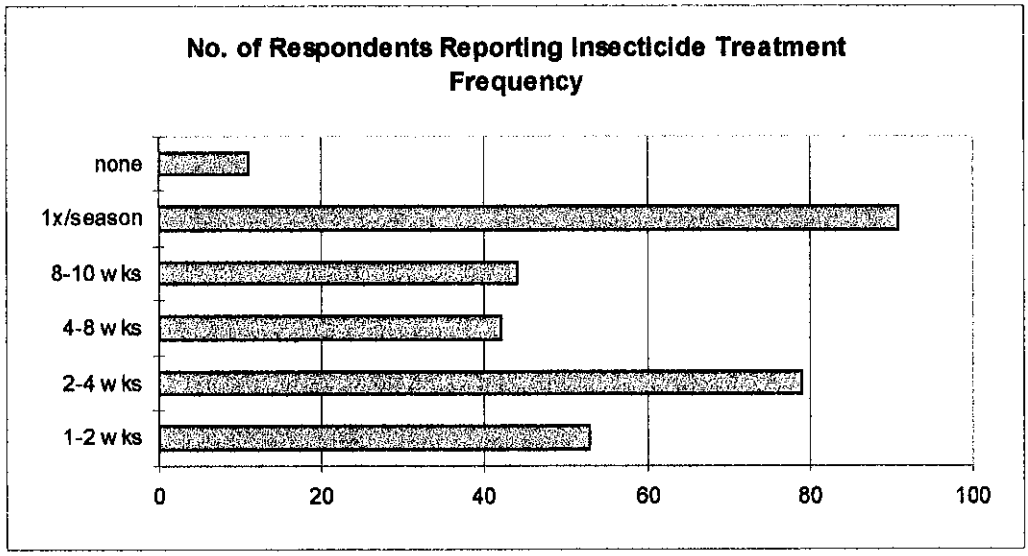


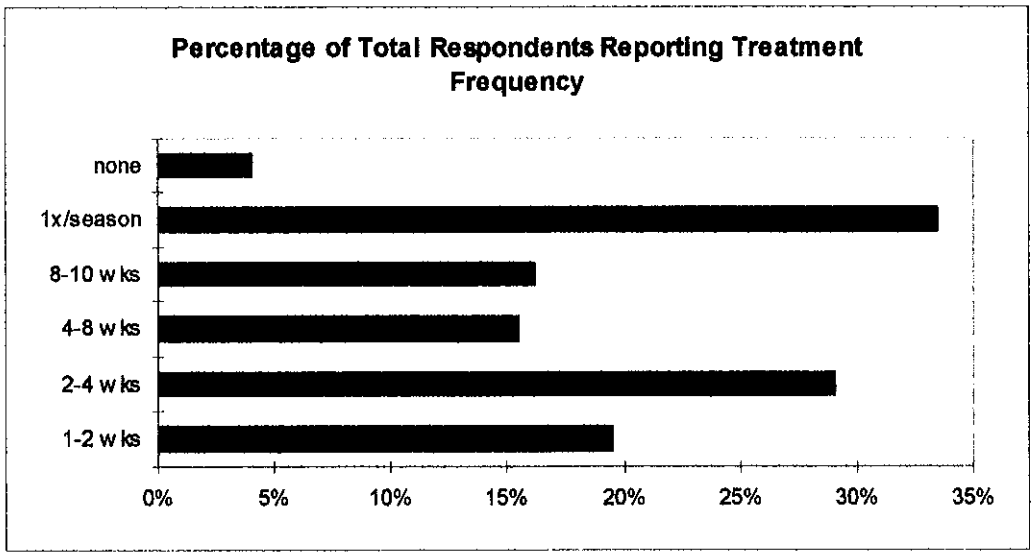
4. What products did you use in the last 12 months for external parasites such as lice, mites, ticks, or flies? Select all used.



The category "Other" represented producers who used spray services but did not know the products as well as products not listed such as diazinon, Ivomec, Eprinex, Cydectin, Durasect,Fly bait, Dibrom, Expar, and parasites. The endectocides Ivomec, Cydectin and Eprinex have limited usefulness as fly control agents; however, some toxicity is noted in the literature. We were unable to calculate actual pounds of ingredients used; however, indications are that the pyrethroids are overwhelmingly preferred. Follow-up with random producers indicated that most felt that fly baits did not work at all and that the fly sprays did not work as well as perhaps a few years ago. This is a subjective observation.

5. How frequently do you apply the external insecticides listed above? Please list the number of the product that was used from the list above.





Follow-up with selected respondents in each of the reporting regions indicated that all of these producers made decisions to treat based on a visual estimate of their animals' discomfort. These producers all treated in-house and ~half used PCAs or contract services. All who used baits were dissatisfied with the bait performance and about half of these producers still use bait. None of our producers could estimate the volume or amount of insecticides used on their farm. Parasites were reported by ~10% of these producers; 50% of these were extremely unhappy

with the parasite performance and were no longer using them. The other 50% believed that the parasites were working but also admitted that they had concurrently improved manure management and had moved calves off their farms. This is important since calf hutches are often the major source of housefly breeding on dairy farms.

6. Which ear tag products did you use in the last 12 months? Select all used.

Only seven producers reported using ear tags; none rotated based on chemistry.

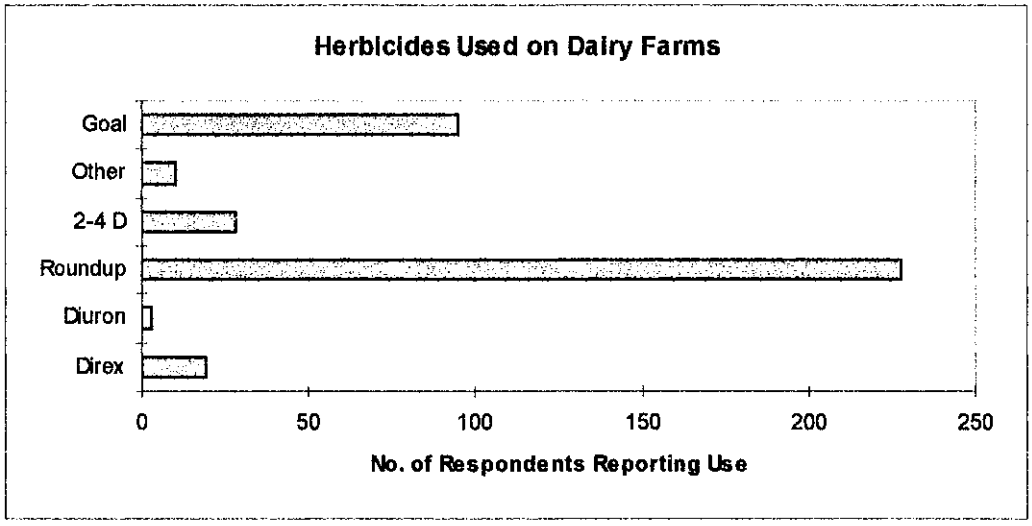
7. How often, per head, do you apply new insecticide eartags?

This question was irrelevant based on the answers to question 6.

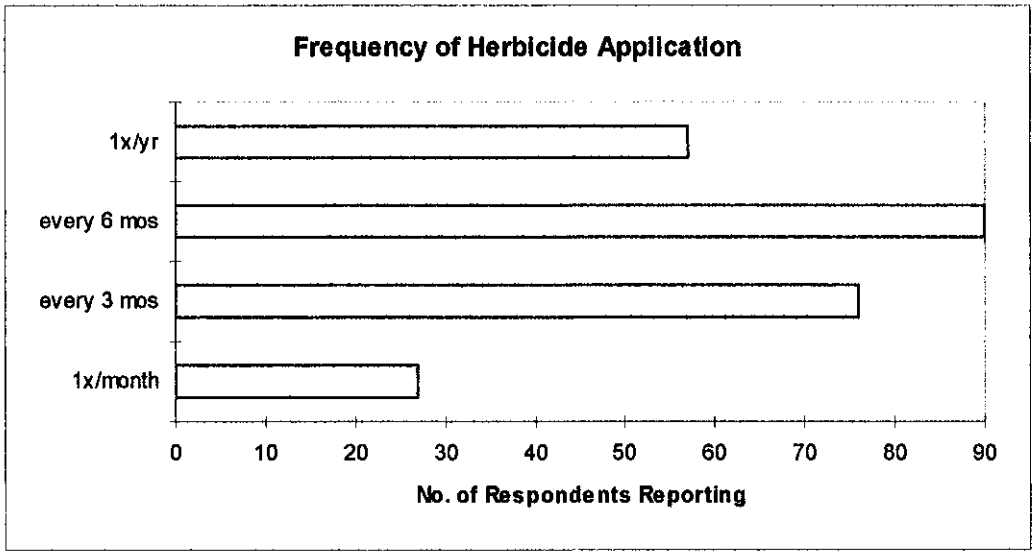
8. Do you rotate between Group A (OP) and Group B (pyrethroid) eartags?

This question was irrelevant based on the answers to question 6.

9. What herbicides do you use in and around the barn and corral areas?

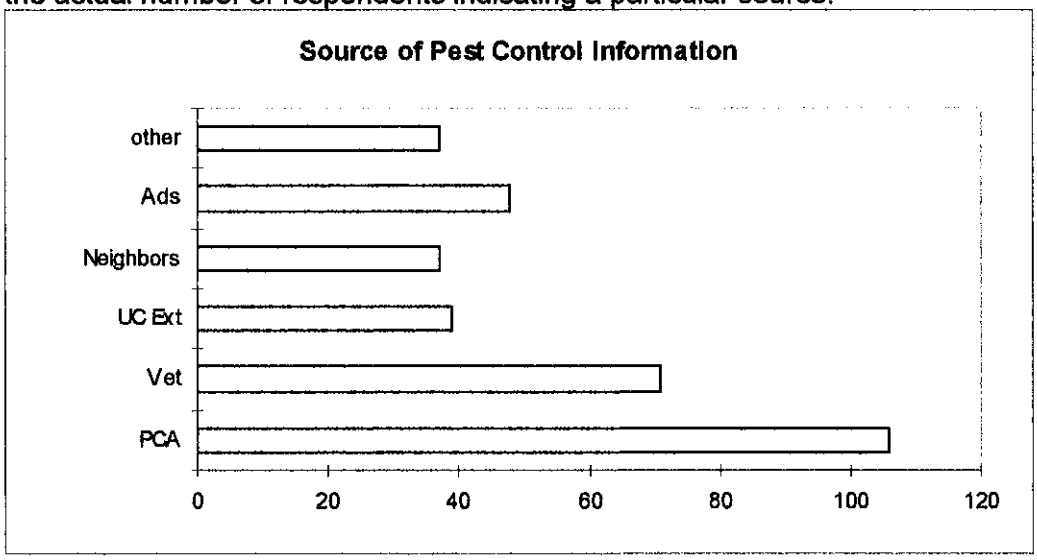


10. How frequently did you apply the herbicides listed above in the last 12 months?

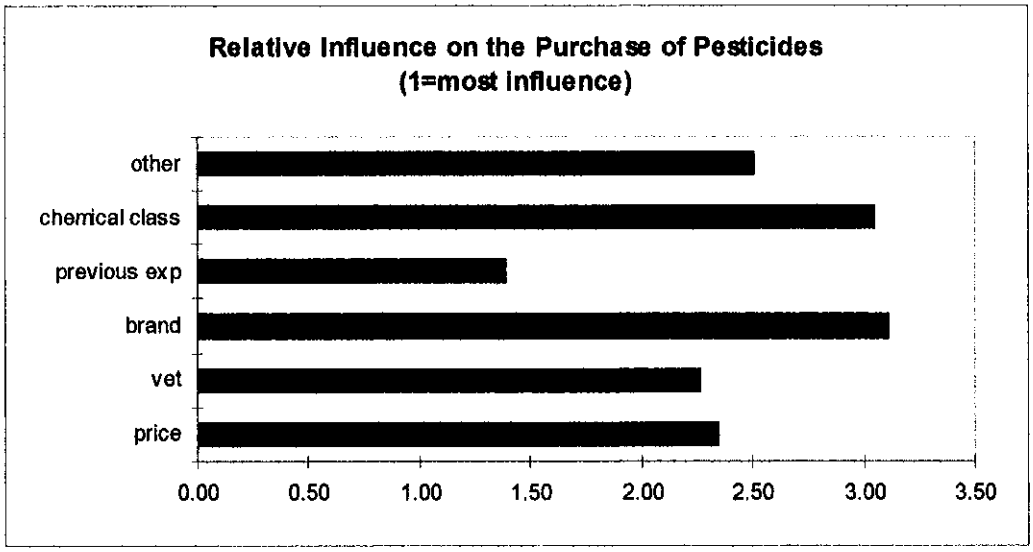


They were also asked to list the product; too few answers to this second half of the question precluded any analysis of the true amounts of herbicide used.

11. What is your primary source of information concerning pest control? The X axis represents the actual number of respondents indicating a particular source.



12. Rank from 1 for the most important to 6 for the least important influence on your purchase of pesticides.



This information was useful in indicating that for education/outreach to occur effectively, the Alliance must reach several influential sectors: key influencers, veterinarians, distributors, PCAs and Cooperative Extension personnel.

13. How many cows, milking and dry, are housed on your facility? The average number of milking and dry cows was 721 per farm.

13. 14. How many replacement heifers are housed on your facility? The total number of replacement heifers averaged 491 per farm.

J. INNOVATION

This evaluation is innovative in that we examined all the pests encountered in dairy production in milking cows, dry cows, replacement heifers and calves. The dairy industry lacks several key pieces of information which would progress IPM: 1) there are very few economic thresholds developed for target pest species; those that are developed are generally developed for cattle in other states and may not be reflective of California production conditions, 2) there is very little information or data on the use of biological control agents (such as fly parasites) for use on California dairies, 3) there is no comprehensive IPM program available which looks at arthropod, rodent, weed, and wild bird management and 4) we heavily depend on many of the compounds under regulatory review and ability to conduct a profitable enterprise would be significantly impacted by loss of these products.

The survey results indicate that the dairy industry is sensitive to several areas of regulatory concern: 1) FQPA fly baits, and fly sprays for use on-animal and in dairies , 2) managing resistance of ectoparasites and public nuisance pest flies on animals or around animal premises 3) protection of endangered species in and around dairy farms where rodents are a problem, and 4) loss of products for treating potential quarantined pests. The options available include:

1. Alternatives to fly sprays and fly baits
   a. The use of mechanical devices can solve two problems: they literally remove flies from the environment and they can be used as monitoring tools. The use of these has not been fully investigated on dairies.
   b. Parasites have shown to be very effective in certain feedlots in the Midwest, however, have not been investigated as tools for use in California operations. Recent availability of

a wider variety of species concurrent with new release strategies may be a route for investigation on California dairies.

c. Using sanitation and monitoring devices to aid both in house fly and stable fly management around dairies.

2. Reducing the potential for rodenticide resistance and exposure of endangered species
   a. A system to monitor rodents would provide a tool whereby growers would not need to leave bait out continuously on dairies. This record keeping would also alert operations as to the effectiveness of their current management program and the need to rotate bait chemistries. Rodent monitoring tools such as live and snap traps serve dual purpose by eliminating the pest as well as documenting rodent activities. These techniques have not been developed in this industry.
   b. Published literature states unequivocally that it is impossible to eliminate rodents by just baiting. Demonstrating the concurrent use of multiple rodent management tools incorporating weed control, live/snap traps, tracking powder and bait pellets and blocks would increase rodent control on the dairies and reduce bait use and dependence. This is complicated by the presence of large open areas of feed storage which harbor numerous rodents—baiting would cause concerns of potential contamination of animal feeds.

3. The loss of several insecticides recently leaves this industry without effective products to combat an exotic economic pest infestation such as the screw worm. It may be possible to discover alternative methods of managing/eradicating these types of pests through communication with countries and states where the pest is endemic. This requires an effort in communication and education within the Dairy Pest Management network.

I. PEST MANAGEMENT CHALLENGES

The challenges that this industry faces are the following:

1. There are no economic thresholds for any of our pest species in California
2. There are misunderstandings about some of the alternative methods available for pest management which can be ameliorated through demonstration, education and outreach programs.
3. There is high likelihood that some pest species will become resistant to the pesticides commonly used such as fly baits, fly sprays and rodenticides.
4. There is a heavy dependence on chemical pesticides for managing pests in this industry and very few biological or cultural control tactics available
5. There is a need to develop programs for pest management in this industry to augment the Quality Assurance Program

Economic and practical issues drive this industry. This group is highly independent, fragmented and variable both in geography, size of operations and herd practices. Progressive dairy men are known to quickly adopt new technology once proven to be effective; however, pest management practices must usually coincide with when and how a herd is handled. Vector management in terms of a HACCP program as defined in feedlot and dairy production, does not have the same visibility or importance as we have seen in the poultry industry. Information gaps continue to exist in management of many of these pest species.

K. KEY CONTACTS

Arthropod pest management expertise is limited in our state. Dr. Nancy C. Hinkle is UC Cooperative Extension veterinary entomologist for the state. Dr. Leslie A. Hickle is a private consultant to commercial confined animal operations in the area of IPM which includes arthropods, rodents, weeds and wild birds. Dr. Brad Mullens is a research faculty veterinary entomologist at UC Riverside who may provide valuable information on pest biology and potential control.

1315 K STREET
MODESTO, CALIFORNIA 95354-0917
TELEPHONE (209) 527 6453
FAX (209) 527-0630

January 7, 2000

Dear Western United Dairymen Members:

The Food Quality Protection Act (FQPA) of 1996 may result in the loss of several essential pesticide products the dairy industry is currently using. Some of the better known products are insecticides such as *Rabon, Ravap, Permecrin, Insectrin, Atroban, Ectiban, Golden Malrin, and Diazinon;* and herbicides such as *Diuron and Direx* (currently under review for their potential impact on surface and groundwater). The loss of these products may significantly affect the dairy industry's ability to manage pests effectively.

Western United Dairymen, in cooperation with the University of California Cooperative Extension, California Department of Pesticide Regulation and Agrilynx Corporation have formed a Pest Management Alliance (PMA) for the California dairy industry We are conducting a survey of the California dairy industry to learn more about what pesticide products are being used and how they are used, in order to assure that dairies are able to continue effective pest management.

In order to gather meaningful data we need you to provide information about pest management practices used on your dairy. This survey will allow us to assess the impact of the FQPA on our industry. Your individual response will be kept ***strictly confidential***. All answers will be pooled with other producers' responses so that we may gain an understanding of how pesticides are being used in California dairy operations. With the information you provide, we will be able to develop educational programs and effective, practical pest control methods that will help increase profitability.

Because we have a short time to complete the project, please take ***five minutes*** to complete this short survey. ***Please fold, tape and mail the self-addressed survey by January 31, 2000.*** Or, you may fax the completed survey to (209) 527-0630. Your participation is greatly appreciated. Call the Western United Dairymen office at (209) 527-6453 if you have any questions about this survey.

The California Dairy Pest Management Alliance ***thanks you!***

Joe Ramos
Project Coordinator
Western United Dairymen

Joe Pimentel, Jr.
Chairman
DQAP & Environmental Issues Committee

/kb

Pest Management Alliance Survey

1. Rank from 1 for the **worst problem** to 12 for the **least problem** for the top 12 pest problems on your dairy.

___stable flies ___face flies ___house flies ___mites
___lice ___ticks ___internal worms ___rats/mice
___squirrels ___gophers ___dogs/coyote/lion ___weeds

2. What control methods do you use for rodents, gophers, squirrels, etc.?

___rodenticide (poisons) ___traps ___guns ___other___________________

3. What control methods do you use for other vertebrate pests such as dogs, coyotes, or mountain lions?

___chemicals (please list) ____
___guns ___personal trapping ___federal/state trapping
___repellents (noise) ___guard dogs ___other___________________________

4. What products did you use in the last 12 months for external parasites such as lice, mites, ticks, or flies? Select all used.

___1 Atroban ___2 Boss ___3 Brute ___4 Cylence
___5 DeLice ___6 Insectrin ___7 Lysoff ___8 Permectrin
___9 Permectrin Dust (bag) ___10 Prolate ___11 Rabon Dust (bag) ___12 Ravap Spotton
___13 Synergized DeLice ___14 Tiguvon ___15 Vapona ___16 VIP Spray
___17 Warbex ___18 Other ____

5. How frequently do you apply the external insecticides listed above? Please list the number of the product that was used from the list above.

___1 to 2 weeks ___2 to 4 weeks ___4 to 8 weeks ___8 to 10 weeks
___once per season ___none applied

6. Which eartag products did you use in the last 12 months? Select all used.

Group A..........................

___1 BovaGard
___2 Cutter Blue
___3 Diaphos
___4 Optimizer
___5 Patriot
___6 Terminator
___7 Warrior
___8 X-Terminator
___9 Z Diazinon

Group B..........................

___1 Atroban Extra
___2 Cutter Gold
___3 Ectrin
___4 GardStar (Plus)
___5 Max-Con
___6 Super Deckem
___7 ZetaGard
___8 Other ___________________

- -

Western United Dairymen
1315 K Street
Modesto, CA 95354

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Modesto, CA 95354

7 How often, per head, do you apply new insecticide eartags?

___once per head ___twice per head ___do not apply insecticide eartags

8. Do you rotate between ***Group A*** and ***Group B*** eartags? (Refer to question 6) ___yes ___no

9. What herbicides do you use in and around the barn and corral areas?

____1 Direx ____2 Diuron ____3 Roundup ____4 2-4-D

____5 Other ____6 Goal ____7 Other _____

10. How frequently did you apply the herbicides listed above in the last 12 months? Please list the number of the product that was used from the list above.

___once a month ___every 3 months ___every 6 months ___once a year

11. What is your primary source of information concerning pest control?

____Pest Control Advisor ____Cooperative Extension ____advertisements

____vet recommendation ____neighbors ____other

12. Rank from 1 for the **most important** to 6 for the **least important** influence on your purchase of pesticides.

___price ___brand name ___chemical class

___vet recommendation ___previous experience ___other

13. How many cows, milking and dry, are housed on your facility? _____

14. How many replacement heifers are housed on your facility?_____

. . . . . .

Please fold the survey on the dotted lines, tape and mail.
Your help in collecting this valuable information is appreciated!

WESTERN UNITED DAIRYMEN

1315 K STREET
MODESTO CALIFORNIA 95354-0917
TELEPHONE (209) 527 6453
FAX (209) 527 0630

Ms Roberta Firoved
Department of Pesticide Regulation
Pesticide Registration Branch
830 K Street
Sacramento, CA 95814

CALIFORNIA DAIRY PEST MANAGEMENT ALLIANCE SUMMARY REPORT

STATUS OF PROJECT – March 6, 2000

Following signing of the standard agreement (agreement #99-0189) with the Department of Pesticide Regulation (DPR) by Mr. Michael Marsh, CEO, Western United Dairymen (WUD), the first meeting of the California Dairy Pest Management Alliance (PMA) was held in Modesto, California on December 21, 1999 at the office of WUD. In attendance at the meeting were Dr. Leslie A. Hickle, Denise Mullinax, Michael Marsh, and Joe Ramos. The purpose of the meeting was to develop the PMA survey that would be sent to dairy producers throughout the state.

Following development of the survey form, approximately 1,100 were mailed to WUD producer members on January 7, 2000 with a cover letter. The letter explained the purpose of the survey and instructed members to return the form by mail or fax to WUD by January 31, 2000. Copies of the cover letter were also mailed to Cooperative Extension dairy farm advisors and creamery field representatives statewide.

WUD received survey responses from 272 dairies representing 186,000 cows and 127,000 replacement heifers. Copies of the surveys were then forwarded to Dr. Leslie Hickle and Dr. Nancy Hinkle to review and compile the responses.

Following the review and compilation of the survey responses, a meeting was held at the Hilmar Cheese Company on February 17, 2000 to review the findings. In attendance at the meeting were Dr. Leslie A. Hickle, Denise Mullinax, and Joe Ramos. At that time it was requested that a follow-up call involving approximately 55 of the original survey respondents from throughout the state would be appropriate.

A list of producers who agreed to be contacted was forwarded by WUD to Dr. Hickle on February 29, 2000.

Going forward, we propose to coordinate a meeting between the PMA core group, Ms. Roberta Firoved with DPR, the Cooperative Extension dairy advisors, creamery field representatives, and dairy-related pest control firms. The PMA core group will explain the purpose of this project to the others in attendance. The group will develop a list of potential dairy producers who will allow us to utilize their facilities to conduct our trials. This meeting is scheduled to take place sometime in mid to late March.

With the information gleaned from this meeting, we are confident that a work plan can be submitted to DPR in April.

If you huve any questions, please feel free to call me at (209) 669-9879.

Respectfully submitted,

Joe Ramos /kb

Joe Ramos

JR/kb